CLAIMS

1. A klystron amplifier comprising means defining a plurality of electron beam paths and means defining plural damped disc-shaped cavities, wherein the plurality of electron beam paths cut the cavities and the Klystron further comprises an annular input cavity and an annular output cavity disposed around the substantially circular external periphery of respective disc-shaped cavities in communication therewith, the output cavity is arranged to receive RF power from the electron beams, wherein the cavities are arranged to support one of a single resonant rotating wave in a whispering-gallery mode, and a single resonant standing wave in a whispering-gallery mode.

2. A klystron according to claim 1, further comprising a wall defining a substantially disc-shaped cavity, the wall having one or more apertures for coupling thereto of electron beam energy, the cavity wall having a substantially circular outer periphery permitting coupling to a substantially annular input or output wave guide, wherein the said coupling is afforded by a plurality of windows distributed along the external periphery of the disc-shaped cavity.

3. A klystron according to claim 2, wherein each window comprises a ceramic member secured to a waveguide wall.

4. A klystron according to any preceding claim comprising an input cavity, two gain cavities, a second harmonic cavity and an output cavity.

5. A klystron according to any preceding claim wherein at least one cavity has an RF absorber member disposed therein.

6. A klystron according to any preceding claim, wherein each cavity has a vacuum port.

7. A klystron according to claim 6, wherein the port is axial.

8. A klystron according to claim 6 or 7, wherein the port has a diameter around 40 cm.

9. A klystron according to claim 6, 7 or 8 having a circular RF absorber member.

10. A klystron according to claim 9 wherein the absorber is of SiC, and extends outwardly from the port by an amount such that the operating mode of the cavity is virtually unaffected.

11. A klystron according to any preceding claim arranged to operate in a $TM_{m,n,q}$ *mode*

12. A klystron according to claim 11, wherein m=11

13. A klystron according to any preceding claim having plural beam tubes.

14. A klystron according to claim 13 having one focussing solenoid per beam tube

15. A klystron according to any preceding claim arranged to operate in the frequency range 900-1000 MHz.

16. A klystron according to any preceding claim arranged to operate at substantially 937 MHz

17. A klystron according to any preceding claim arranged to provide tens of megawatts.

18. A klystron according to claim 17 arranged to provide about 50 MW.

19. A klystron according to any preceding claim having a waveguide around each input and output cavity.

20 A klystron according to any preceding claim arranged to operate with a power conversion efficiency over 65 %

21. A klystron according to claim 20 arranged to operate with a power conversion efficiency of over 70%

22. A klystron according to any preceding claim wherein the transverse beam spacing in a cavity is about half a wavelength.

23. A klystron according to any preceding claim wherein the diameter of the beam pipe is small

24. A klystron according to any preceding claim wherein the diameter is about 1/16 of the operating wavelength.

25. A klystron according to any preceding claim arranged to operate in a having a common vacuum pump and operating at 10^{-8} mbar or better.

26. A klystron having a wall defining a substantially disc-shaped cavity, the wall having one or more apertures for coupling thereto of electron beam energy, the cavity wall having a substantially circular outer periphery permitting coupling to a substantially annular input or output wave guide, wherein the said coupling is afforded by a plurality of windows distributed along the external periphery of the disc-shaped cavity.

27. A klystron according to claim 26, wherein each window comprises a ceramic member secured to a waveguide wall.

28. A super multibeam klystron comprising a klystron according to any preceding claim wherein there are plural sets of beams, each set having plural beams, and each set cuts each cavity at a respective aperture.

29. A super multibeam klystron according to claim 28, having plural beam tubes, each beam carrying plural mini beams.

30. A super multibeam klystron according to claim 28, having plural beam tubes, each beam carrying a single mini beam.